



### REMARKS

Claims 1-6 and 8 are pending in the application. The specification has been amended to correct typographical errors. The amendments to claims 1 and 8 have been made to further clarify the present invention. Support for "single crystalline" in the amended claim 1 can be found *inter alia* at page 7 in the specification. Support for "wherein the dicarboxylic acid precursor is selected from the group consisting of pentanediol, 1,5-dibromopentane, 1,5-dichloropentane, glutaronitrile, glutamic imide, and glutaryldialdehyde" in the amended claim 1 can be found in claim 7 as originally presented. Support for the amended claim 8 can be found in claim 1 as originally presented. No new matter has been inserted into the application.

### Specification

The specification has been amended to correct mistyped "glutononitrile" to "glutoronitrile" at pages 3-4 in the specification. Support for "glutoronitrile" in the amended specification can be found at pages 6-7 in specification. Therefore, no new matter has been inserted into the application.

### Rejection Under 35 USC § 103(a) over Sun (US 4,783,445) in view of Kawachi (US 4,981,948)

Claims 1-8 have been rejected under 35 USC § 103(a) as being unpatentable over Sun in view of Kawachi. Applicants traverse this rejection. Reconsideration and withdrawal thereof are respectfully requested.



### **The Presently Claimed Invention**

The presently claimed invention is directed to a method for preparing a single crystalline catalyst for polymerization of aliphatic polycarbonates under a pressurized condition in water and a method for polymerizing aliphatic polycarbonates using the catalyst.

### **Sun**

Sun discloses a process for preparing soluble catalyst by reacting zinc compounds with anhydrides in the presence of alcohol. Sun further discloses a process for preparing soluble zinc catalyst for copolymerization of epoxides and carbon dioxide to form polycarbonates. However, Sun fails to disclose or suggest a method for preparing a single crystalline catalyst for polymerization of aliphatic polycarbonates under a pressurized condition in water and a method for polymerizing aliphatic polycarbonates using the catalyst as in the presently claimed invention.

### **Kawachi**

Kawachi discloses a process for preparing a polyalkylene carbonate using a zinc-containing solid catalyst prepared by contacting zinc oxide with an organic dicarboxylic acid under a mechanical pulverization treatment or in the presence of an organic solvent under a mechanical pulverization treatment. However, Kawachi fails to disclose or suggest a method for preparing a single crystalline catalyst for polymerization of aliphatic polycarbonates under a pressurized condition in water and a method for polymerizing aliphatic polycarbonates using the catalyst as in the presently claimed invention.

### **Distinctions of the presently claimed invention over the cited references**

The Examiner has failed to establish *prima facie* obviousness of the presently claimed invention. There fails to be motivation to combine the cited references to arrive at the presently claimed invention as none of the cited references in combination or independently discloses or

suggests a method for preparing a single crystalline catalyst for polymerization of aliphatic polycarbonates under a pressurized condition in water and a method for polymerizing aliphatic polycarbonates using the catalyst as in the presently claimed invention.

The Sun reference fails to be relevant to the presently claimed invention because Sun discloses merely a soluble catalyst which is prepared by reacting zinc compounds with anhydrides in the presence of alcohol, not water. Further, the reaction temperature for preparation of the catalyst in the Sun reference is in the 0-150°C range, more preferably in the 20-110°C range, and most preferably in the 50-90°C range. In contrast, the reaction temperature for preparation of the inventive catalyst in the presently claimed invention is in the 120-180°C range, which is different from the preferably practiced 20-110°C temperature range in the Sun reference. In contrast to the Sun reference, the distilled water is vaporized when the reaction temperature range is from 120 to 180°C in the presently claimed invention.

The Kawachi reference fails to remedy the deficiencies in the Sun reference in failing to disclose or suggest a method for preparing a single crystalline catalyst for polymerization of aliphatic polycarbonates under a pressurized condition in water and a method for polymerizing aliphatic polycarbonates using the catalyst as in the presently claimed invention because Kawachi discloses merely preparation of the catalyst under mechanical pulverization treatment in the presence or absence of an organic solvent. However, nowhere in Kawachi does it disclose or suggest that the preparation of the catalyst under pressurized condition should occur in water.

In the presently claimed invention, the oxidation process under a pressurized condition in water results in a zinc dicarboxylic acid ester in a single crystalline form, which has uniform surface structure derived from its regularly arranged inner structure. Such uniformity of the surface structure allows the catalyst to exhibit high catalytic activity for copolymerization of

carbon dioxide and alkylene oxide compared to conventional catalyst. Furthermore, such single crystalline structure renders preparation of aliphatic polycarbonates with constant yield and a narrow molecular weight distribution during copolymerization.

Although the Examiner states that Kawachi teaches preparation of catalyst in the presence of water, Applicants respectfully disagree. Kawachi does not prepare catalyst in the presence of water. Kawachi states that “water by-produced during the reaction of zinc oxide with the organic dicarboxylic acid as well as alcohols and amines of the organic solvents used in the preparation of the zinc-containing solid catalyst will act as a polymerization inhibitor.” See column 4 lines 43-48. Therefore, Kawachi actually implies that water is an undesirable byproduct during preparation of the catalyst. Thus, Kawachi is not applicable to the presently claimed invention. Moreover, claims 1 and 8 have been amended to further distinguish the presently claimed invention. Accordingly, it is believed that the presently claimed invention is not obvious over the cited references.

### **Conclusion**

It is believed that the application is now in condition for allowance. Applicants request the Examiner to issue a notice of Allowance in due course. The Examiner is encouraged to contact the undersigned to further the prosecution of the present invention.

The Commissioner is authorized to charge JHK Law's Deposit Account No. **502486** for any fees required under 37 CFR §§ 1.16 and 1.17 and to credit any overpayment to said Deposit Account No. **502486**.


Respectfully submitted,

**JHK Law**

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